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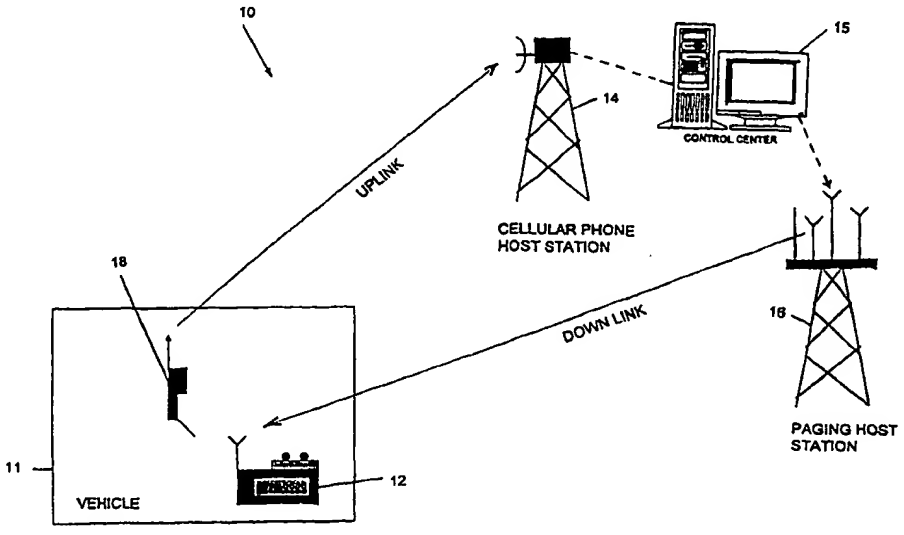

(57) Abstract

A parking management system (10) is provided which includes a parking unit (12) for installing in a vehicle (11), at least one paging system host station (16), forming part of a paging system network, for communicating with the parking unit (12) to activate the parking unit (12) to display an indication that parking is validated, and at least one telephone communications (TCN) host station (14), forming part of a telephone telecommunications network, for communicating with the paging system host station (16) and for receiving communications from the vehicle user (18).

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SYSTEM AND METHOD FOR MANAGEMENT OF VEHICLE PARKING

FIELD OF THE INVENTION

The present invention relates to a system for the management of vehicle parking, specifically using existing telecommunication networks.

BACKGROUND OF THE INVENTION

The ever increasing volume of traffic and demand for limited parking space has required municipal authorities, especially in cities to monitor and control the parking of vehicles. In order to maintain traffic flow within the cities, parking is generally restricted to specifically marked parking bays or preferably off-street locations. Numerous systems have been proposed and implemented to efficiently and effectively ensure parking for residents and visitors alike.

Examples of parking control systems include parking meters adjacent parking bays requiring the insertion of coins as payment for specific parking periods, and the display of prepaid parking cards marked to indicate the parking period. Off-street parking generally requires payment to be made on entry or exit of as parking lot, either automatically monitored or manually supervised.

One of the main problems associated with paid parking is the abuse of the various systems by avoiding payment either by non-payment of parking for a longer period of time than paid for, thereby depriving the municipal authority from revenue. One common system for monitoring parking is to use inspectors who are authorized to issue parking tickets or fines for non-compliance with parking regulations and other abuses of the system. The use of inspectors is expensive and though parking fines may be issued, there is no guarantee that they will be paid, thus requiring additional resources for collection of the fines.

SUMMARY OF THE PRESENT INVENTION

It is an object of the present invention to provide a management system for vehicle parking system which overcomes the limitations and disadvantages of prior art systems.

It is a further object of the present invention to provide a system which utilizes existing telecommunications networks for recording, monitoring and controlling payment for parking.

It is a yet further object of the present invention to provide a parking unit for installing in a specific vehicle for use with the parking management system.

It is a yet further object of the present invention to provide an inspection unit for checking the parking units installed in vehicles.

There is therefore provided, in accordance with a preferred embodiment of the present invention, a parking management system which includes a parking unit for installing in a vehicle, at least one paging system host station, forming part of a paging system network, for communicating with the parking unit to activate the parking unit to display an indication that parking is validated, and at least one telephone communications (TCN) host station, forming part of a telephone telecommunications network, for communicating with the paging system host station and for receiving communications from the vehicle user.

Furthermore, in accordance with a preferred embodiment of the present invention, the telephone communications (TCN) host station includes a control center.

Additionally, there is provided, in accordance with a preferred embodiment of the present invention, a parking management system which includes a parking unit for installing in a vehicle, at least one paging system host station, forming part of a paging system network, for communicating with the parking unit to activate the parking unit to display an indication that parking is validated, at least one telephone communications (TCN) host station, forming part of a telephone telecommunications network, for receiving communications from the vehicle user and a control center for communicating with the telephone communications (TCN) host station and the paging system host station.

Furthermore, in accordance with a preferred embodiment of the present invention, the telephone telecommunications network is any one of a group including a cellular phone network and a public switched telephone network (PSTN).

Additionally, there is provided, in accordance with a preferred embodiment of the present invention, a parking management system which includes a cellular parking unit for installing in a vehicle, at least one telephone communications (TCN) host station, forming part of a cellular telephone telecommunications network, for receiving communications from the cellular parking unit, and a control center for communicating with the telephone communications (TCN) host station and the a cellular parking unit.

Furthermore, in accordance with a preferred embodiment of the present invention, the parking unit includes a receiving unit for receiving a secure wireless message, a security processing module coupled to the receiving unit for decoding and authenticating the wireless message a processor coupled to the security processing module and an indicator display coupled to the processor, for displaying an indication if the secure wireless message is authenticated. The receiving unit may be a wireless paging receiver for receiving messages from a paging system station and a cellular transceiver for receiving messages from a cellular telephone telecommunications network.

Additionally, in accordance with a preferred embodiment of the present invention, the parking unit further includes an infra red transceiver having an emitting LED connected thereto, the infra red transceiver being coupled to the security processing module. In addition, the parking unit includes a smart card reader coupled to the security processing module for authenticating the validity of a smart card issued to the user.

Furthermore, in accordance with a preferred embodiment of the present invention, the indicator display includes at least one of a group including audio indicators, visual indicators and an alpha numeric LCD display.

Furthermore, in accordance with a preferred embodiment of the present invention, the system further includes an inspection unit for authenticating the parking unit. The inspection unit includes an encoding security processing

module, a processor coupled to the encoding security processing module, and an infra red transmitter, having an emitting LED connected thereto, coupled to the encoding security processing module. A keypad is coupled to the processor.

Additionally, there is provided, in accordance with a preferred embodiment of the present invention, a method for the management of parking by vehicles. The method includes the steps of:

supplying a parking unit to an user for installation in the user's vehicle;

activating the parking unit to display an indication when parking is requested by the user;

canceling the indicated display when parking is terminated by the user;

recording the time between the steps of activating and canceling of the indicated display; and

calculating the cost of parking.

Furthermore, in accordance with a preferred embodiment of the present invention, the step of activating the parking unit includes the steps of:

transmitting a secure wireless message to the parking unit; and

decoding and authenticating the wireless message.

Additionally, there is provided, in accordance with a preferred embodiment of the present invention, a method for authenticating a parking unit installed in a vehicle using an inspection unit. The method includes the steps of:

the inspection unit generating and encoding a signal;

transmitting the signal to the parking unit; and

if the parking unit is valid, the parking unit decoding the signal and displaying an indication of the parking unit's authenticity.

Furthermore, in accordance with a preferred embodiment of the present invention, the step of transmitting further includes the steps of:

converting the generated digital signal to analog impulses; and

transmitting the analog signal via an infra red transmitter to the parking unit.

Finally, in accordance with a preferred embodiment of the invention., there is also provided a parking management system which includes a cellular parking unit for installing in a vehicle, at least one telephone communications

(TCN) host station, forming part of a cellular telephone telecommunications network, for receiving communications from the cellular parking unit, and a control center for communicating with the telephone communications (TCN) host station and the a cellular parking unit.

Additionally, in accordance with a preferred embodiment of the invention the cellular parking unit includes a cellular transceiver for receiving a secure wireless message, a security processing module coupled to the cellular transceiver for decoding and authenticating the wireless message, a processor coupled to the security processing module and an indicator display coupled to the processor, for displaying an indication if the secure wireless message is authenticated.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description taken in conjunction with the drawings in which:

Fig. 1 is a schematic illustration of the parking management system, constructed and operative in accordance with an embodiment of the present invention;

Fig. 2 is a high level block diagram illustration of the components of the system of Fig. 1;

Fig. 3 is a block diagram illustration of the parking unit used with the parking management system of Figs. 1 and 2;

Fig. 4/1 and 4/2 is a flow chart illustration of the operation for requesting "phone-in" parking for a cellular phone user of the system of Figs. 1 and 2;

Fig. 5 is a flow chart illustration of the operation for terminating "phone-in" parking for a cellular phone user of the system of Figs. 1 and 2;

Fig 6 is a schematic illustration of a parking management system, constructed and operative in accordance with a further embodiment of the present invention;

Fig 7 is a schematic illustration of a parking management system, constructed and operative in accordance with a further embodiment of the present invention;

Fig. 8 is a high level block diagram illustration of an inspection unit;

Fig. 9 is a flow chart illustration of authenticating a parking unit of Fig. 3;

Fig. 10 is a flow chart illustration of a method for charging and collection of the parking charge;

Fig. 11 is a schematic illustration of the parking management system, constructed and operative in accordance with an alternative embodiment of the present invention;

Fig. 12 is a block diagram illustration of the cellular parking unit used with the parking management system of Fig. 12; and

Fig. 13/1 and 13/2 is a flow chart illustration flow chart illustration of the operation for "phone-in" parking for a cellular parking unit Fig. 11.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference is made to Figs. 1 and 2. Fig. 1 is a schematic illustration of the parking management system, generally indicated 10, constructed and operative in accordance with an embodiment of the present invention. Fig. 2 is a high level block diagram illustration of the components of the parking management system 10.

Parking management system 10 comprises a parking unit 12 for installing in a vehicle 11, at least one telephone communications(TCN) host station 14 forming part of a telephone telecommunications network, a control center 15 for managing of the system and at least one paging system host station 16 forming part of a paging system network. The TCN host station 14 acts to receive calls from vehicle owners wishing to commence and terminate parking ("phone-in" parking) and for routing the calls via the control center 15 to the paging system host station 16.

Parking unit 12 is configured to receive a secure wireless message, which is unique to each parking unit, generated by the paging system host station 16, decode and authenticate the message and to display an indication that the vehicle, having the parking unit 12, has requested and is paying for parking. The parking unit 12 is prominently displayed in the vehicle to indicate whether parking is being paid for.

In the preferred embodiment of Figs. 1 and 2, the telephone telecommunications network is a cellular phone network. The user can use his cellular phone 18 from his vehicle, or from any other location away from his vehicle, to connect to the TCN host station 14 of the telephone telecommunications network to request parking.

Different specific dialing numbers are preferably allocated by the telephone telecommunications network (TCN) 14 for commencing and terminating "phone-in" parking. TCN host station 14 includes a call router 20 for receiving the uplink from cellular phone 18 from the user made to the specific "phone-in" parking numbers and for routing the calls to control center 15.

Control center 15 comprises a modem 22 coupled to a central processing unit 24. Modem 22, which is any suitable known in the art modem, receives calls from the TCN host station and transfers information to the paging system network 16.

It will be appreciated that the control center 15 may be located at any suitable location, for example, at the TCN host station 14. In this case, control center 15 acts as a transceiver for receiving calls from the TCN 14 and for transmitting to the paging system network 16.

The paging system host station 16 comprises a receiver 26 for receiving calls from the control center 15, a central processor 28 and a transmitter 29 for transmitting a signal to the parking unit 12 installed in the vehicle 11. Central processor 28 is coupled to receiver 26 and transmitter 29.

In order to utilize the "phone-in" parking service provided, the potential user obtains a parking unit 12 for installing in a particular vehicle and registers with the control center 15. Preferably, as part of a client database record, the users name, cellular phone number and vehicle registration number are noted and recorded at the control center 15.

Reference is now made to Fig. 3 which is a block diagram illustration of parking unit 12. Parking unit 12 comprises a wireless paging receiver 30, a processor 32, an encoding/decoding security processing module 34, a smart card reader 36 and a panel of indicators 38. Wireless paging receiver 30, processor 32 and smart card reader 36 are coupled to encoding/decoding security processing module 34. Panel indicators 38 are coupled to processor 32.

Parking unit 12 further comprises storage memory 40 and a real time clock 42 coupled to processor 32 and security processing module 34. Additional functional blocks which may be connected to the processor 32 of parking unit 12 include an activation keypad 44, an alpha numeric LCD display 46, an audio conversion module 48, a speaker 50 and an RS-232 external port 52. A "valid" decoded signal is indicated visually on the front panel indicators 38, such as LED lamps. Alternatively, a "valid" signal can generate a textual message on the alpha-numeric display 46 and/or an audio message on the speaker 50, the audio conversion module 48 converting the message to audio format.

The keypad 44 allows for user input by the parking inspector during smart card authentication, for example.

In a preferred embodiment, parking unit 12 additionally comprises an infra red transceiver 56, having an emitting LED 58 connected thereto, which is coupled to security processing module 34.

Parking unit 12 is powered by a power module 54 preferably having batteries 57 and additionally, an external power port 55 connected thereto for charging or for connecting to a suitable power source such as the vehicle's batteries.

The operation of "phone-in" parking for a cellular phone user will now be described with reference to the flow chart of Figs. 4/1 and 4/2. A registered user with the "phone-in" parking service, having installed his parking unit 12 in a prominent location in the vehicle, requests parking by dialing a pre-designated number to the cellular telephone company (step 202). The TCN host station 14 of the cellular telephone company identifies the user from the cellular phone number and advises the control center 15 (step 204), which then informs the paging system host station 16 (step 205) by sending a pre-assigned signal indicating that "parking" is requested together with details of the user.

The paging system host station 16 checks whether the dialer is entitled to the service (step 206) and if the dialer is registered, paging system host station 16 sends a secure wireless message to the specific parking unit 12 belonging to the user (step 208).

The dispatched secure wireless message is received by an antenna 51 connected to the wireless paging receiver 30 and decoded by the encoding/decoding signal (or security) processing module 34 (step 210) and passed to the processor 32 (step 212) .

Concurrently, the security processing module 34 authenticates the user smart card 36 (step 214) and if genuine (query box 216) is passed to the processor 32 (step 212). Provided that the signal is decoded (step 210) and the smart card 36 is validated (step 216) allows the processor 32 to authenticate the message validity (step 218).

A valid authenticated message activates the indicators (step 220) either by generating a "valid" visual indication on the front panel indicators 38, and/or generating a textual message on the alpha-numeric display 46 and/or generating an audio message on the speaker 50 via the audio conversion module 48.

If the internal power is low, an appropriate message will be displayed on the alpha-numeric LCD panel 46. RS-232 external port 52 is used to connect external hardware for maintenance purposes and for updating the real time clock 42.

It will be appreciated that the activation of the parking unit 12 is not restricted to the user having a smart card 36. The steps of authentication (steps 214-216) however restricts the use of the parking unit 12 to individuals having a smart card 36. Thus, parking is linked directly to a specific user as opposed to the vehicle containing the parking unit 12.

The operation of terminating the parking service is similar to that of initiating "phone-in" parking and will now be described with reference to the flow chart of Fig. 5. The user dials a specific "parking termination" number (step 230), allocated by the telephone telecommunications network 14. The TCN host station 14 of the cellular telephone company identifies the user from the cellular phone number and advises the control center (step 232) which then informs the paging system host station 16 (step 233) to terminate the service by sending a pre-assigned signal indicating that "parking is to be terminated" together with details of the user.

The paging system host station 16 sends a coded "termination" signal to the specific parking unit 12 belonging to the user (step 234). The secure wireless message activates the parking unit 12 (step 236) to cancel the "parking ON" display

Reference is now made to Fig. 6 which is a schematic illustration of a further embodiment of the parking management system, generally indicated 50, constructed and operative in accordance with an embodiment of the present invention. Parking management system 50 is similar to parking management system 10 except that the telephone communications(TCN) host station 52 is part

of a landline telephone communications, such as a public switched telephone network (PSTN) network, as opposed to the cellular phone network of Fig. 1.

To request parking, the vehicle owner contacts the TCN host station 52 via a landline up-link 54 which, via control center 15, informs the paging system 16 (indicated by dashed line 56) that "parking" is desired. The paging system 16 authorizes parking by transmitting a signal to the parking unit 12, as described hereinabove with reference to Fig. 4.

In an alternative embodiment of the invention, parking management system, generally designated 60, illustrated in Fig. 7, to which reference is now made, comprises a parking unit 62 for installing in a vehicle, at least one telephone communications(TCN) host station 14 forming part of a telephone telecommunications network, a control center 15 for managing of the system, at least one paging system host station 16 forming part of a paging system network and an inspection unit 64. Elements of this embodiment of the invention which are similar to elements which have been previously described with respect to the preferred embodiment hereinabove, are similarly designated and will not be further described.

Inspection unit 64 is an encoded infra red transmitter which is configured to transmit an Infra Red (IR) encoded burst of digital information, when activated. Each transmission generates an individual code stream, using a known Public Key encryption method, such as a RSA based encryption method. Inspection unit 64 is used by inspectors to authenticate the parking unit 62 installed in a vehicle 11.

Reference is now made to Fig. 8 which is a high level block diagram illustration of inspection unit 64.

Inspection unit 64 comprises a processor 66, an encoding security processing module 68, storage memory 70, a real time clock 72, an activation keypad 74, a test port indicator 76, an infra red transmitter 78 having an emitting LED 80 connected thereto, an RS-232 external port 82 and a power module 84.

Infra red transmitter 78 and processor 66 are coupled to encoding security processing module 68. Storage memory 70 and a real time clock 72 are coupled to processor 66 and encoding security processing module 68. Test port

indicator 76, RS-232 external port 82 and activation keypad 74 are all coupled to processor 66.

Inspection unit 64 is powered by a power module 84 preferably having batteries 57 and additionally, having an external power port 86 connected thereto for charging. RS-232 external port 82 is used to connect external hardware for maintenance purposes and for updating the real time clock 72.

The operation of the inspection unit 64 for inspecting a parking unit 62 installed in a vehicle will now be described with reference to the flow chart of Fig. 9. The inspector checking a vehicle parking unit 62 uses the keypad 74 of his inspection unit 64 to enter the parking area code. (step 302). Only a valid cellular parking unit 102 will reply by means of an "OK" pre-established code in the form of a visual indication.

The processor 66 sends a digital "check valid" signal command (step 304) to the security processing module 68. Once the security processing module 68 receives such a signal, it will encode it (step 306) using a Public Key Method and send it to the Infra Red transmitter 78 (step 308). The IR transmitter 78 converts the signal to analog impulses and sends it to the transmitting LED 80 (step 310).

If the transmitting LED 80 is activated, the Test Port indicator 76 (which may be a lamp, is also activated (step 312) on the device panel indicating transmission in process. If the internal power is low, the Test Port light 76 will flash rapidly when the "activation" key on the keypad is pressed one hour before battery exhaustion.

The transmitted infrared secure message is received by the infra red transceiver 56 of the parking unit 62 (step 314), it is decoded by the security processing module 34 and transferred to the processor 32 (step 316). This received message causes the panel indicators 38 and alpha-numeric LCD 46 to post an appropriate message, consequently authenticating the parking unit 62 (step 318).

In order to prevent unauthorized interference with the parking unit 62, the parking unit 62 can be designed to delete its decoding program should an attempt be made, by non-authorized personnel, to open the parking unit 62.

Reference is now made to Fig. 10 which is a flow chart illustration of a method for charging and collection of the parking charge.

The registered user dials the telephone company to request parking (step 250). The TCN host station 14 of the telephone company identifies the user and his location from the phone number, records the time and advises the control center 15 which informs the paging system host station 16 to begin the service (step 252).

On completion of parking, the user again dials the TCN host station 14 to terminate the call (step 254). The TCN host station 14 of the telephone company identifies the user and his location from the phone number, records the time and advises the control center 15 which informs the paging system host station 16 to stop the service (step 256).

The cost of parking is calculated by the control center 15 (step 258). The total time the vehicle has parked (that is, between the phone calls requesting commencement and termination of service) is calculated according to time and other criteria, such as location and time of day. The control center 15 notifies each of the telecommunications network carrier 14 (step 259) of their clients parking account. The charge for parking is added to the user's telephone bill for collection (260) by the carrier. The parking charge is collected by the telecommunications network as part of its normal collection procedure (step 262).

The status of the collected parking revenues is reported to the control center 15 (step 264) who then apportions the received revenue between the paging company (step 266), the local authority responsible for parking (step 268) and the telecommunications network carrier. Since a telephone telecommunications network can also identify the area from which a call is being made, in the case of a cellular phone network from the location of the local host station and in the case of a landline telephone telecommunications network (Fig. 6) from the number of the telephone making the call, variable charges depending on the area can be incorporated into the system.

It will be appreciated by persons skilled in the art that the present invention is not limited to a system which includes the use of a paging system network to act as the interface between the telephone communications (TCN)

host station and the connected control center, and the parking unit installed in the vehicle.

Reference is now made to Fig. 11, which is a schematic illustration of the parking management system, generally indicated 100, constructed and operative in accordance with an alternative embodiment of the present invention. Elements of this embodiment of the invention which are similar to elements which have been previously described with respect to the preferred embodiment hereinabove, are similarly designated and will not be further described.

Parking management system 100 is similar to parking management systems 10 and 60, comprising a cellular parking unit 102 installed in a vehicle 11, at least one telephone communications (TCN) host station 14 forming part of a cellular telephone telecommunications network and a control center 15, for managing the system, connected thereto. Parking management system 100 operates without the paging system network, described hereinabove with respect o Figs. 1 and 7. In addition, the parking management system 100 comprises an inspection unit 64, as described hereinabove with respect to Fig. 7.

Cellular parking unit 102, which is illustrated in Fig. 12, combines the functions of parking unit 12, described hereinabove with respect to Fig. 3, and cellular phone 18 (Fig. 1). The wireless paging receiver 30 (Fig. 3) of parking unit 12 is replaced by a cellular transceiver, generally designated 104.

Cellular transceiver 104 is a wireless parking tool service and communication device carries out the functions of a cellular phone 18, for requesting and negotiating parking toll service. Cellular transceiver 104 may be any known in the art transceiver suitable for CDMA (Code Division Multiple Access), TDMA(Time Division Multiple Access), AMPS or GSM, for example.

Device authentication is carried out via the IR transceiver 56 as described hereinabove with respect to Fig. 3.

To request and negotiate parking toll service, cellular parking unit 102 transmits and receives wireless cellular secure messages (via the embedded wireless cellular unit) to host station 14. The unit is authenticated by control center 15 and an acknowledgment message sent back by host station 14 to the

cellular parking unit 102. Such transmission is initiated from the device's keypad 44.

A wireless cellular message which is received is decoded (module 34) and the user authenticated by comparison with a personalized Smart Card inserted in the Smart Card ID reader 36. If the user is authenticated, an appropriate visual indication is displayed on the device front panel 38.

Cellular parking unit 102 can receive and decode secure infra-red digital authentication transmissions sent by an inspection unit 64 which wishes to authenticate the cellular parking unit 102.

A feature of cellular parking unit 102 is its capability of transmitting secure infra-red digital transmissions to other cellular parking unit 102. In addition, cellular parking unit 102 can receive and play short audio messages digitally received and decoded by the cellular transceiver module 104 or the infra red transceiver module 56.

The operation of "phone-in" parking for a cellular phone user will now be described with reference to the flow chart of Fig. 13. A registered user with the "phone-in" parking service, having installed his cellular parking unit 102 in a prominent location in the vehicle, requests parking by dialing a pre-designated number to the cellular telephone company using the unit's keypad 44 (step 402).

A wireless secure message is sent to the control center 15 (step 404) which decodes the message and authenticates the user (step 406), opens a parking toll service START record (step 408) and dispatches a secure acknowledge message back to the cellular parking unit 102 (step 410).

The dispatched secure wireless message is received by the wireless cellular module and decoded by the security application module (step 412) and passed over to the computer module (step 414).

Concurrently, the security application module (SAM) checks the user smart card (step 416) and if genuine (query box 418),is passed to the computer module to authenticate the message validity (step 420).

A valid decoded message actuates the indicators (step 422), that is it either generates an OK visual indication on the front panel, and/or generates a

textual message on the alpha-numeric display and/or generates an audio message on the speaker via the audio conversion module.

To authenticate the cellular parking unit 102, the inspector activates his inspection unit 64, as described hereinabove with respect to flow chart of Fig. 9.

Briefly, when activated by the inspector, an Infra Red (IR) encoded burst of digital information is sent by the inspection unit 64 to the cellular parking unit 102. The digital information contains an authentication code as well as the parking "area" code.

If the device was authenticated and the parking session validated but the parking area code was found to be erroneous, the cellular parking unit 102 is automatically forced by the inspection unit 64 to initiate transmission to the Service Provider in order to update the parking record with the correct area code. Only thereafter is the "OK" indication turned on by the cellular parking unit 102.

Once the secure message is received by the infra red transceiver in the cellular parking unit 102, it is decoded by the security application module 34 and transferred to the processor 32. This received message will cause the panel indicators 38 and/or the alpha-numeric LCD 46 to post an appropriate message, indicating the authentication of the cellular parking unit 102.

If the internal power is low, an appropriate message will be displayed on the alpha-numeric LCD panel 46.

It will be further appreciated by persons skilled in the art that the present invention is not limited to what has been particularly shown and described hereinabove. Rather the scope of the present invention is defined only by the claims which follow:

CLAIMS

1. A parking management system comprising:
   a. a parking unit for installing in a vehicle;
   b. at least one paging system host station, forming part of a paging system network, for communicating with said parking unit to activate said parking unit to display an indication that parking is validated; and
   c. at least one telephone communications (TCN) host station, forming part of a telephone telecommunications network, for communicating with said at least one paging system host station and for receiving communications from the vehicle user.

2. A system according to claim 1, wherein said at least one telephone communications (TCN) host station comprises a control center.

3. A parking management system comprising:
   a. a parking unit for installing in a vehicle;
   b. at least one paging system host station, forming part of a paging system network, for communicating with said parking unit to activate said parking unit to display an indication that parking is validated;
   c. at least one telephone communications (TCN) host station, forming part of a telephone telecommunications network, for receiving communications from the vehicle user; and
   d. a control center for communicating with said telephone communications (TCN) host station and said at least one paging system host station.

4. A system according to claim 1 wherein said telephone telecommunications network is any one of a group including a cellular phone network and a public switched telephone network (PSTN).

5. A system according to claim 1, wherein said parking unit comprises:
   a. a receiving unit for receiving a secure wireless message;

b. a security processing module coupled to said receiving unit for decoding and authenticating said wireless message;

c. a processor coupled to said security processing module; and

d. an indicator display coupled to said processor, for displaying an indication if said secure wireless message is authenticated.

6. A system according to claim 5 wherein said receiving unit comprises one of a group consisting of a wireless paging receiver for receiving messages from a paging system station and a cellular transceiver for receiving messages from a cellular telephone telecommunications network.

7. A system according to claim 5, further comprising an infra red transceiver having an emitting LED connected thereto, said infra red transceiver being coupled to said security processing module.

8. A system according to claim 5, further comprising a smart card reader coupled to said security processing module for authenticating the validity of a smart card issued to the user

9. A system according to claim 5 wherein said indicator display comprises at least one of a group including audio indicators, visual indicators and an alpha numeric LCD display.

10. A system according to claim 5 and further comprising a keypad coupled to said processor.

11. A system according to claim 1 and further comprising an inspection unit for authenticating said parking unit.

12. A system according to claim 11 wherein said inspection unit comprises

a) an encoding security processing module;

b) a processor coupled to said encoding security processing module;

c) an infra red transmitter, having an emitting LED connected thereto, coupled to said encoding security processing module.

13. A system according to claim 12 and wherein said inspection unit further comprises a keypad coupled to said processor.

14. A parking unit for use in a parking management system comprising:
    a. a receiving unit for receiving a secure wireless message;
    b. a security processing module coupled to said receiving unit for decoding and authenticating said wireless message;
    c. a processor coupled to said security processing module; and
    d. an indicator display coupled to said processor, for displaying an indication if said secure wireless message is authenticated.

15. A parking unit according to claim 14 wherein said receiving unit comprises one of a group consisting of a wireless paging receiver for receiving messages from a paging system station and a cellular transceiver for receiving messages from a cellular telephone telecommunications network.

16. A parking unit according to claim 14, further comprising an infra red transceiver having an emitting LED connected thereto, said infra red transceiver being coupled to said security processing module.

17. A parking unit according to claim 14, further comprising a smart card reader coupled to said security processing module for authenticating the validity of a smart card issued to the user

18. A parking unit according to claim 14 wherein said indicator display comprises at least one of a group including audio indicators, visual indicators and an alpha numeric LCD display.

19. A parking unit according to claim 14 and further comprising a keypad coupled to said processor.

20. An inspection unit for authenticating a parking unit installed in a vehicle, said parking unit forming part of a parking management system, said inspection unit comprising:
    a) an encoding security processing module;
    b) a processor coupled to said encoding security processing module;
    c) an infra red transmitter, having an emitting LED connected thereto, coupled to said encoding security processing module.

21. An inspection unit according to claim 20 and further comprising a keypad coupled to said processor.

22. A method for the management of parking by vehicles, said method comprising the steps of:

supplying a parking unit to an user for installation in said user's vehicle;

activating said parking unit to display an indication when parking is requested by said user;

canceling said indicated display when parking is terminated by said user;

recording the time between said steps of activating and canceling of said indicated display; and

calculating the cost of parking.

23. A method according to claim 22, wherein said step of activating said parking unit comprises the steps of:
transmitting a secure wireless message to said parking unit; and
decoding and authenticating said wireless message.

24. A method for authenticating a parking unit installed in a vehicle using an inspection unit, said method comprising the steps of:

the inspection unit generating and encoding a signal;

transmitting said signal to said parking unit; and

if the parking unit is valid, said parking unit decoding said signal and displaying an indication of said parking unit's authenticity.

25. A method according to claim 20 wherein said generated signal is a digital signal and wherein said step of transmitting further comprises the steps of:

converting said digital signal to analog impulses; and

transmitting said analog signal via an infra red transmitter to said parking unit.

26. A parking management system comprising:

a. a cellular parking unit for installing in a vehicle;

b. at least one telephone communications (TCN) host station, forming part of a cellular telephone telecommunications network, for receiving communications from said cellular parking unit; and

c. a control center for communicating with said telephone communications (TCN) host station and said a cellular parking unit.

27. A system according to claim 26, wherein said cellular parking unit comprises:

a. a cellular transceiver for receiving and transmitting wireless messages;

b. a security processing module coupled to said cellular transceiver for decoding and authenticating said wireless messages;

c. a processor coupled to said security processing module; and

d. an indicator display coupled to said processor, for displaying an indication if said secure wireless message is authenticated.

28. A system according to claim 27, further comprising an infra red transceiver having an emitting LED connected thereto, said infra red transceiver being coupled to said security processing module.

29. A system according to claim 27, further comprising a smart card reader coupled to said security processing module for authenticating the validity of a smart card issued to the user

30. A system according to claim 27 wherein said indicator display comprises at least one of a group including audio indicators, visual indicators and an alpha numeric LCD display.

31. A system according to claim 27 and further comprising a keypad coupled to said processor.

32. A system according to claim 26 and further comprising an inspection unit for authenticating said parking unit.

33. A system according to claim 32 wherein said inspection unit comprises

a) an encoding security processing module;

b) a processor coupled to said encoding security processing module;

c) an infra red transmitter, having an emitting LED connected thereto, coupled to said encoding security processing module.

34. A system according to claim 33 and wherein said inspection unit further comprises a keypad coupled to said processor.

35. A system according to claim 28 wherein said transceiver is a transceiver for receiving and transmitting data via one of a group of communication methods including CDMA (Code Division Multiple Access), TDMA (Time Division Multiple Access), AMPS and GSM systems.

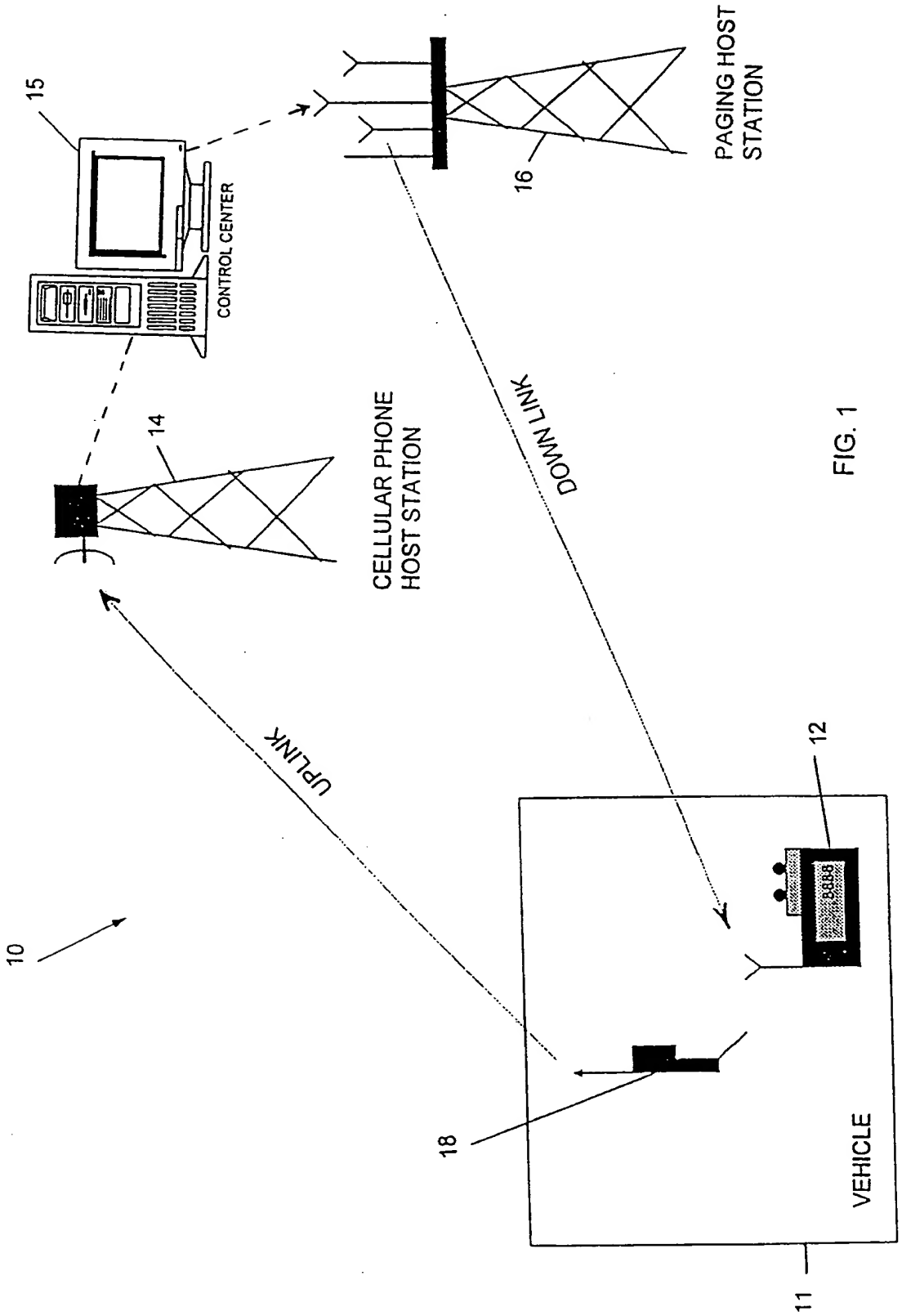

FIG. 1

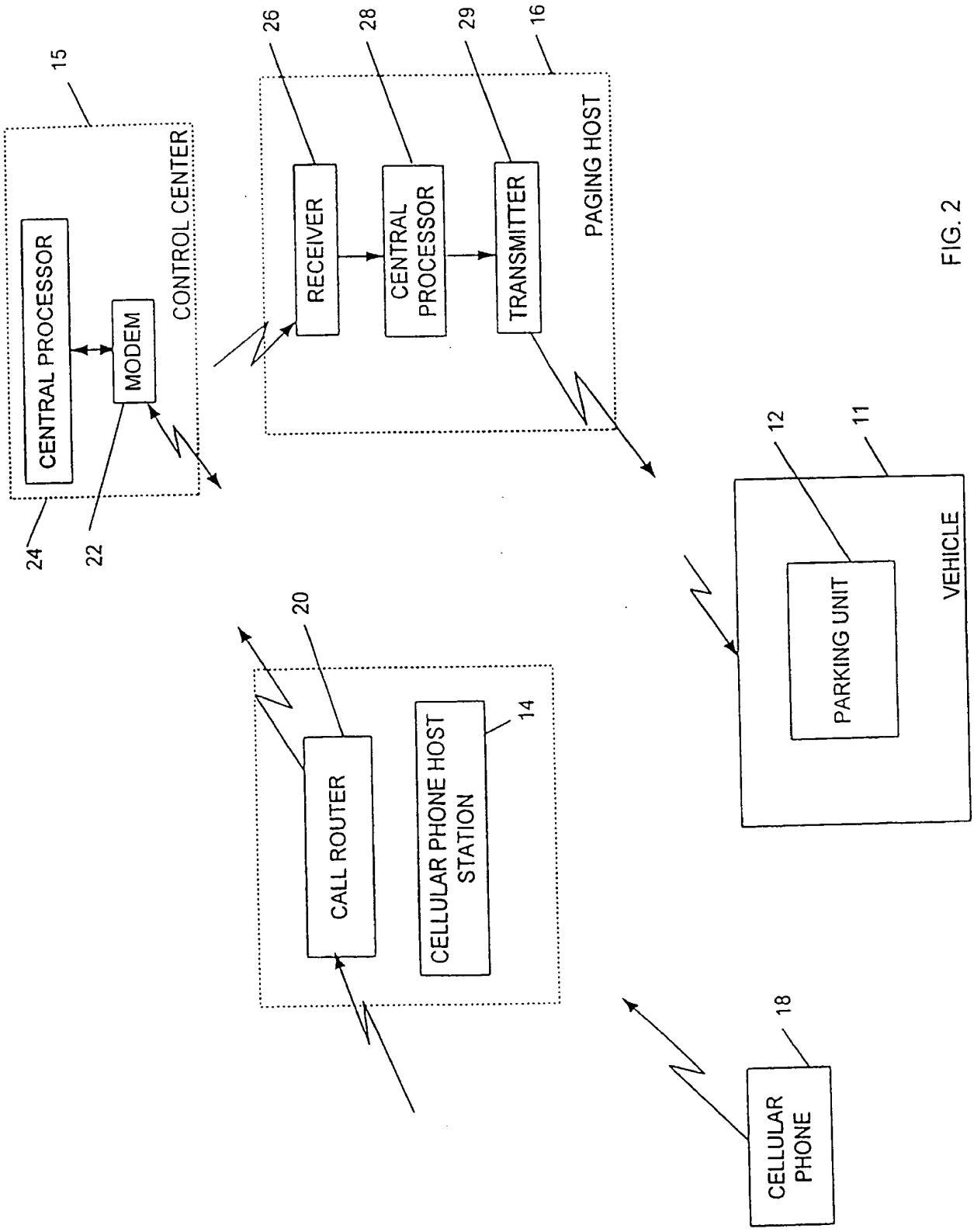

FIG. 2

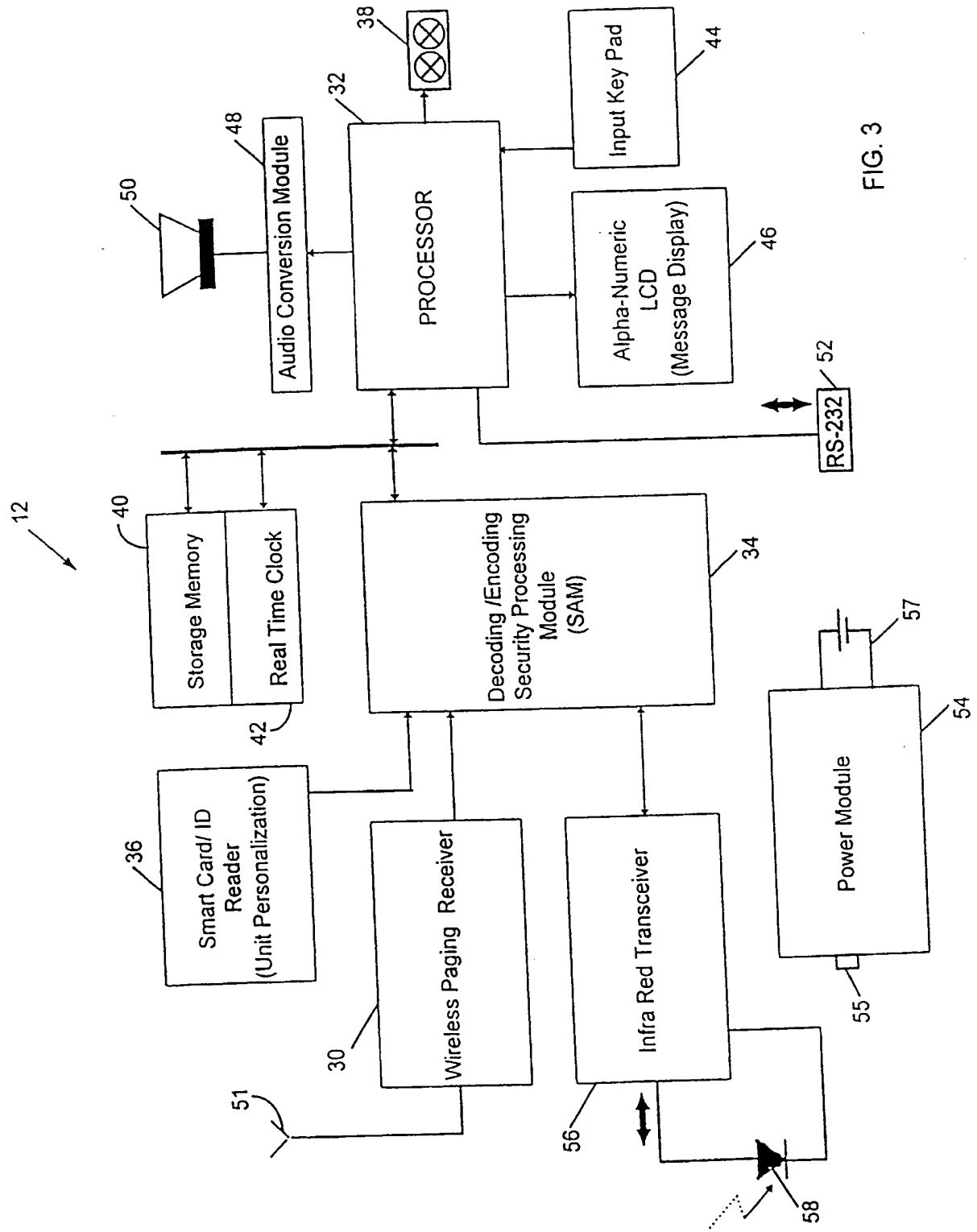

FIG. 3

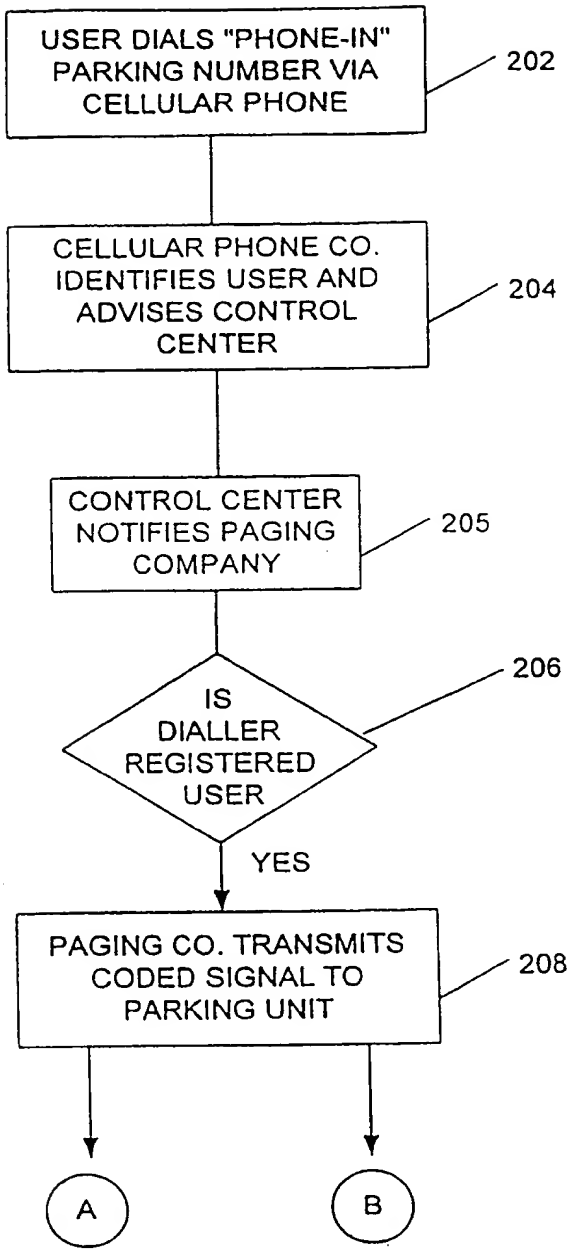

FIG. 4/1

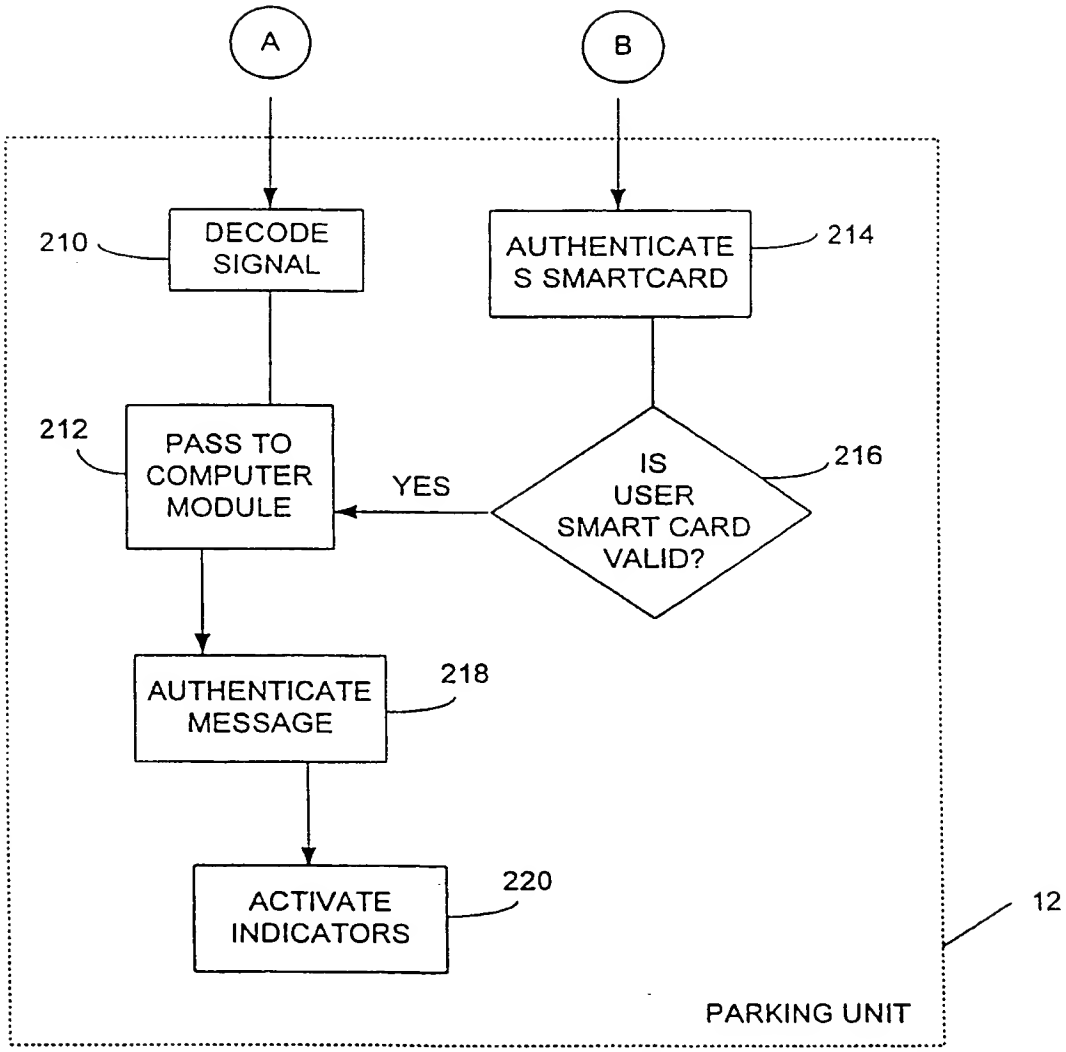

FIG. 4/2

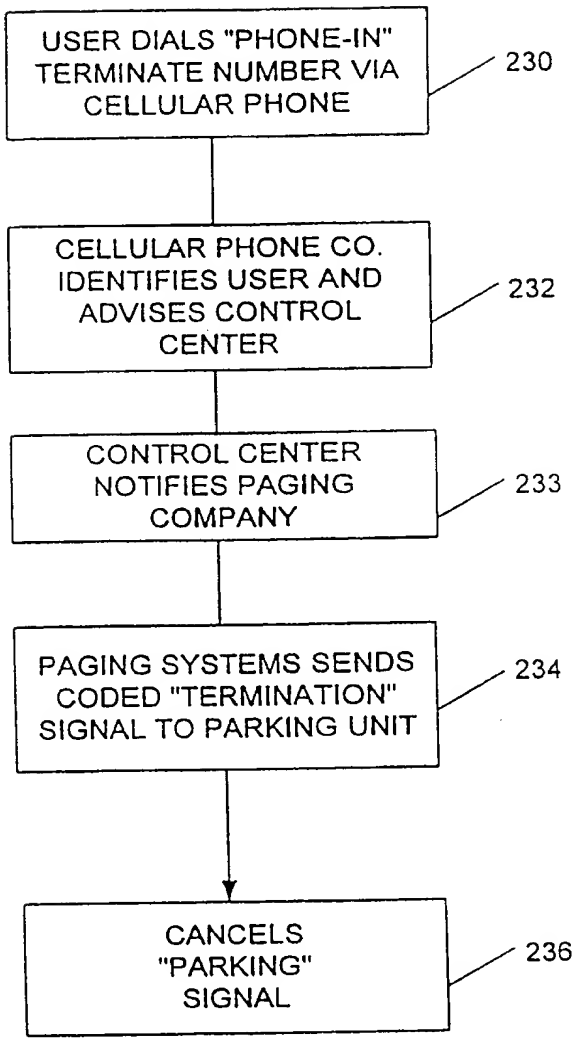

FIG. 5

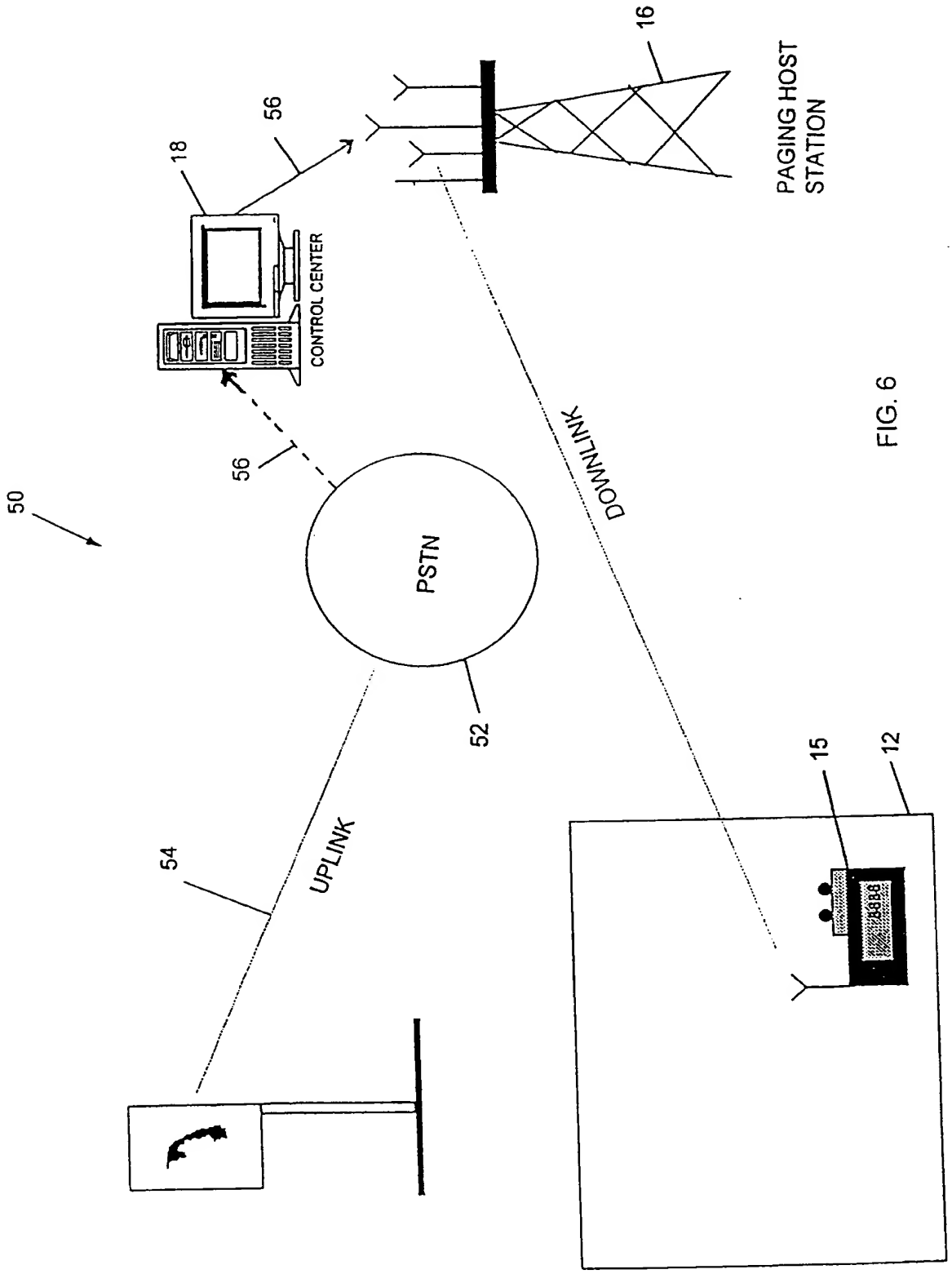

FIG. 6

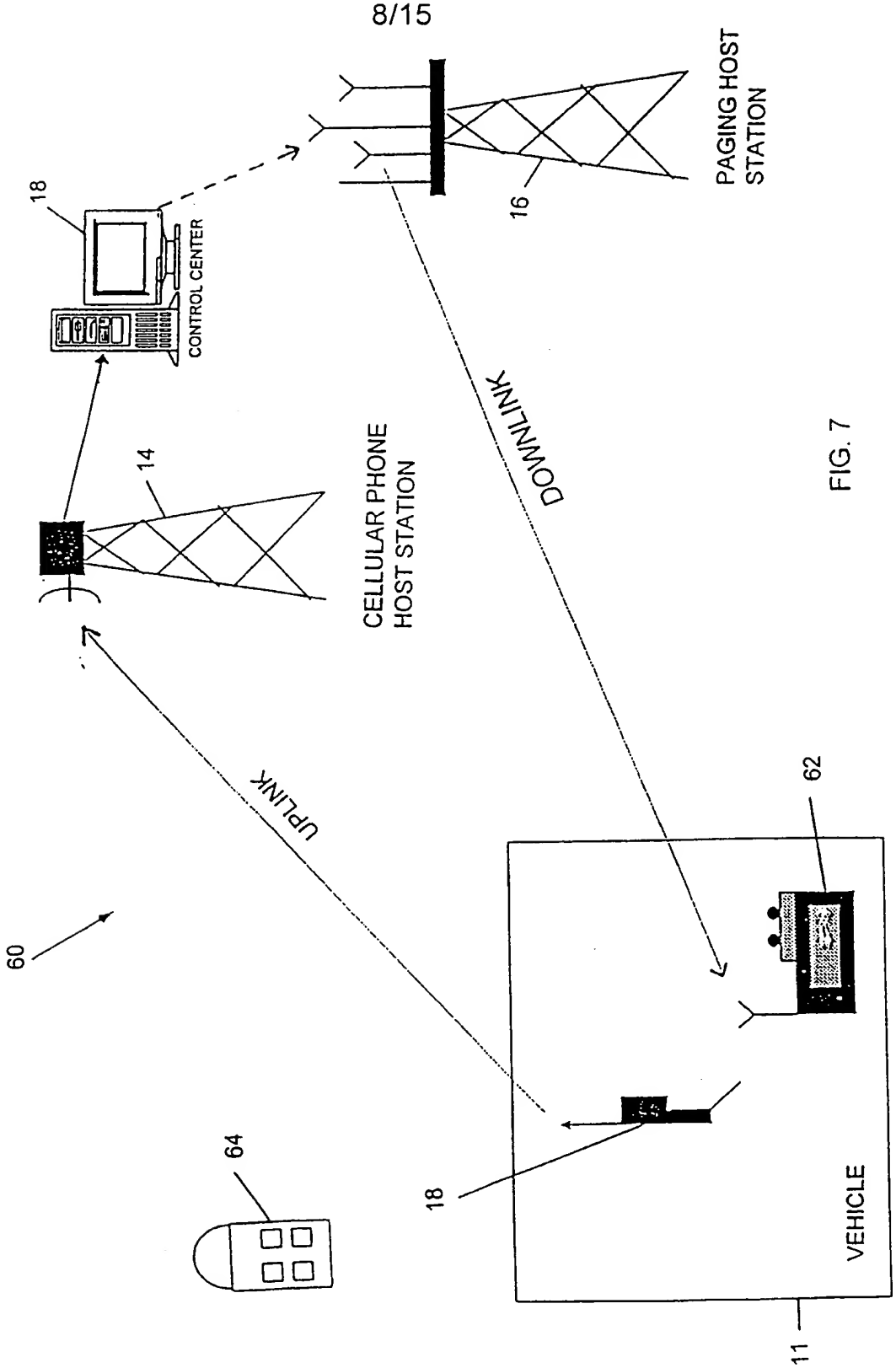

FIG. 7

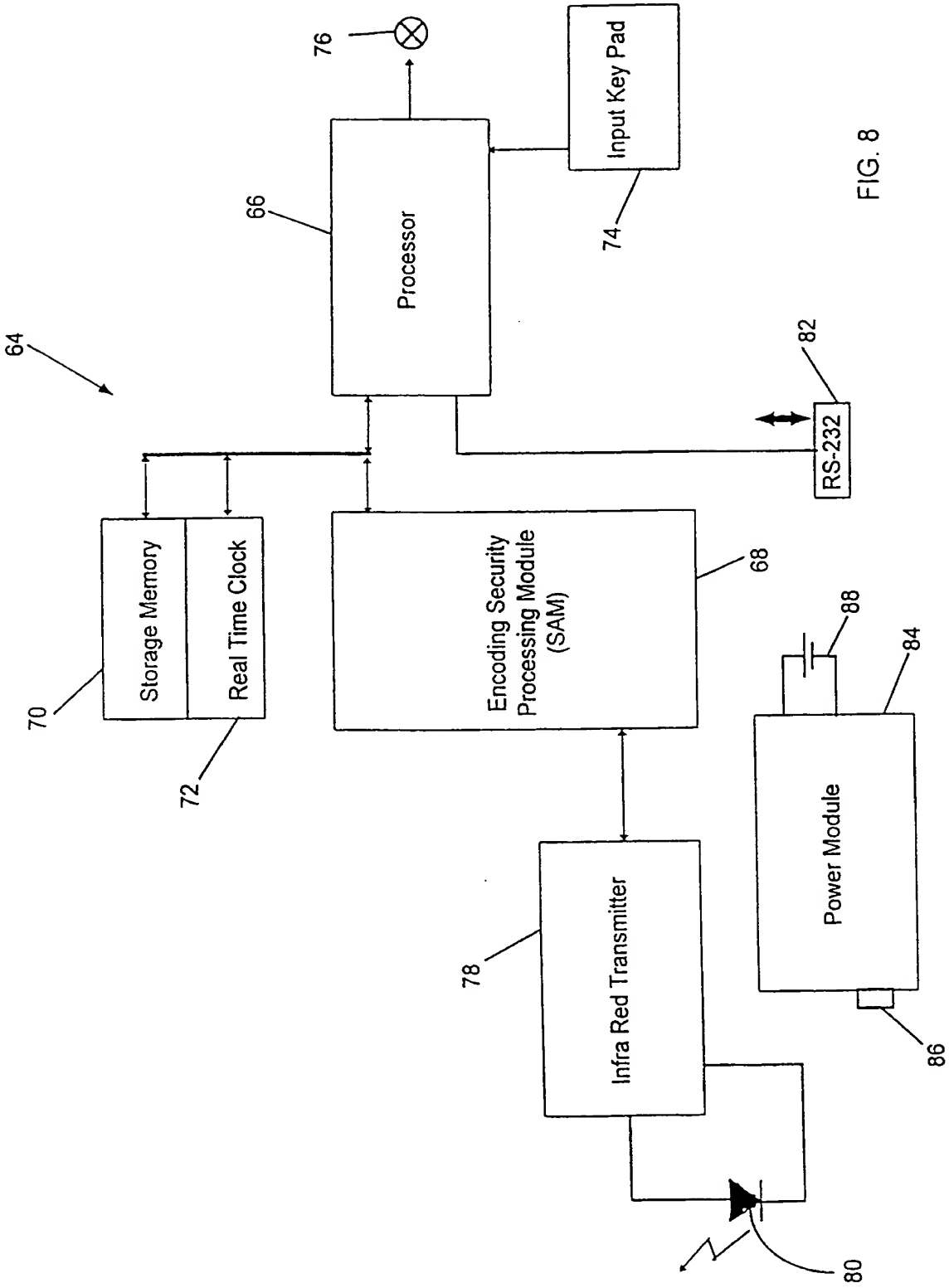

FIG. 8

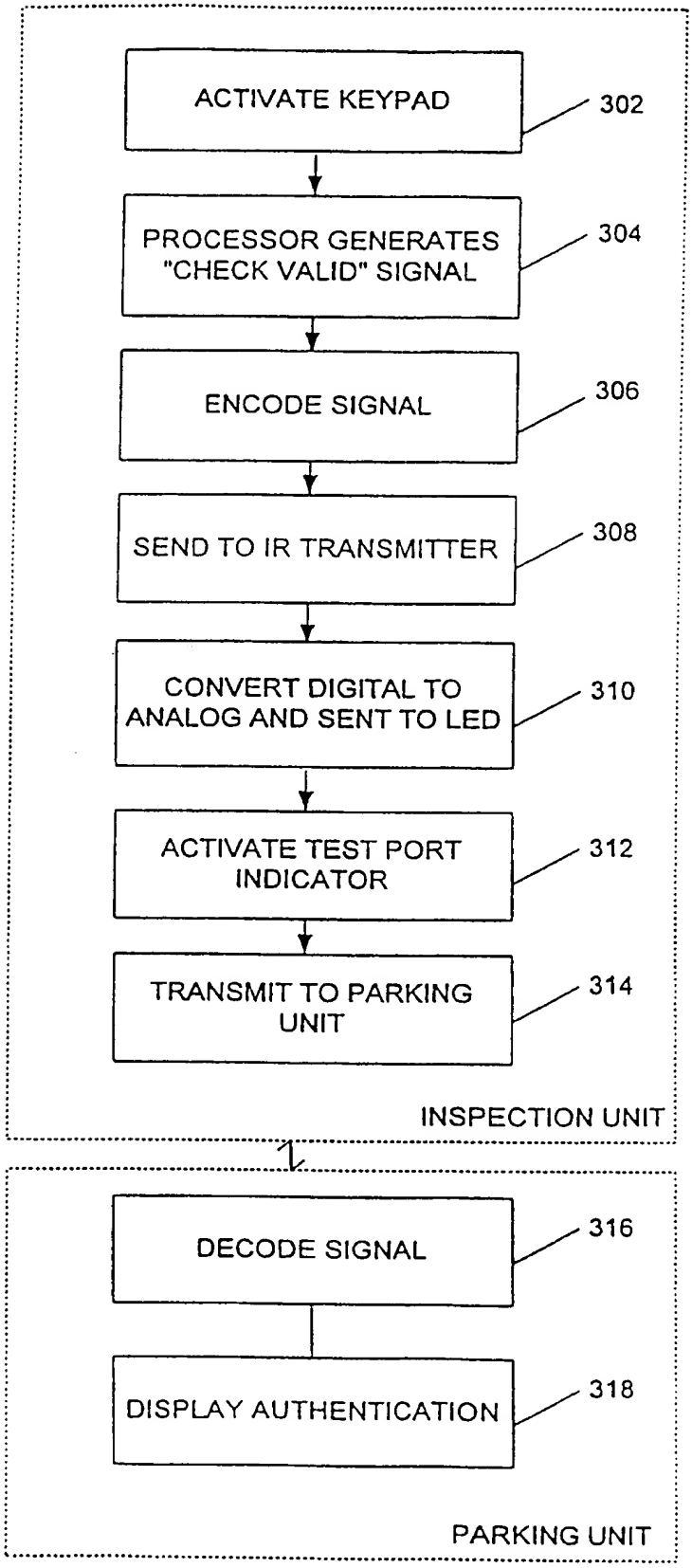

FIG. 9

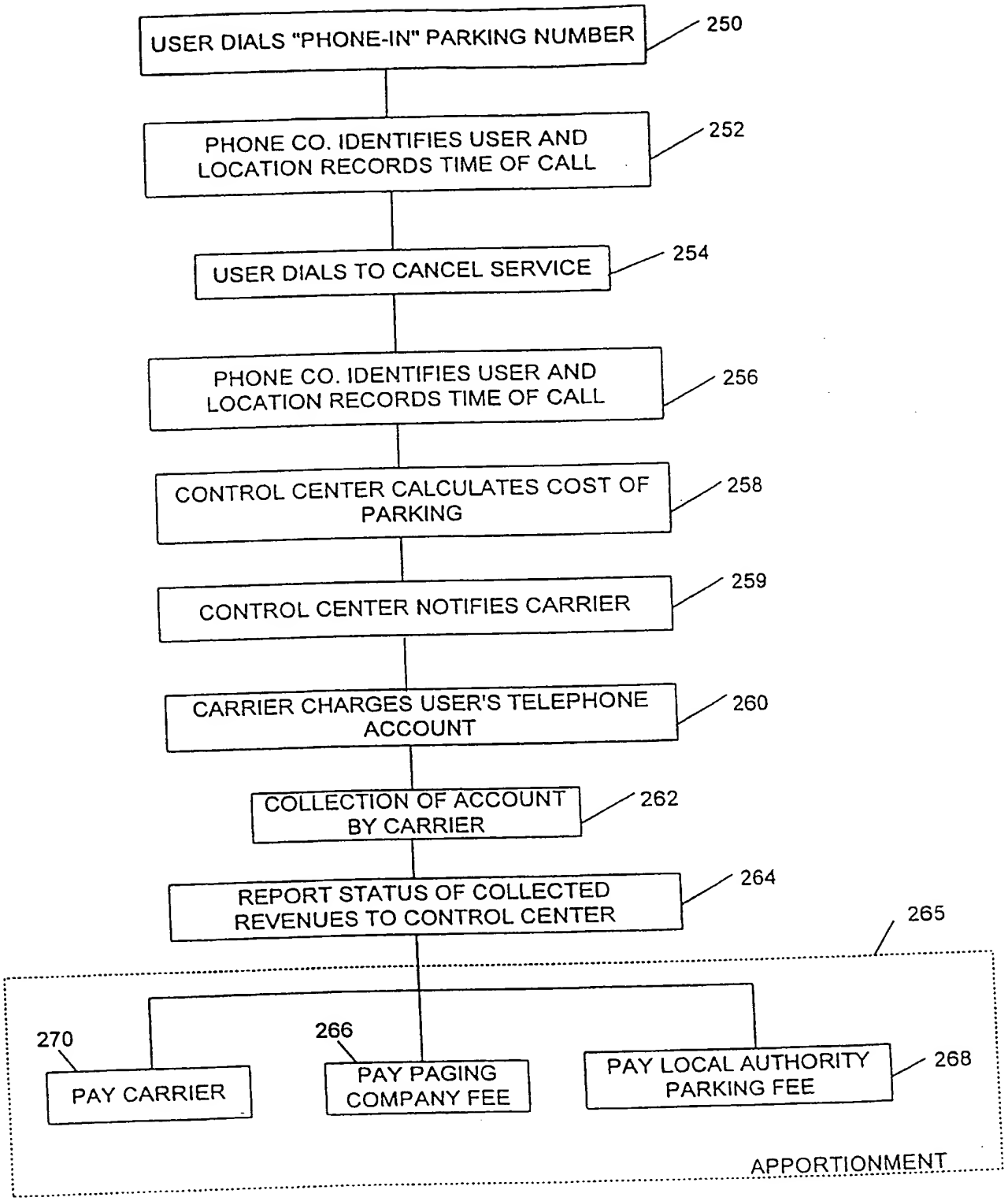

FIG. 10

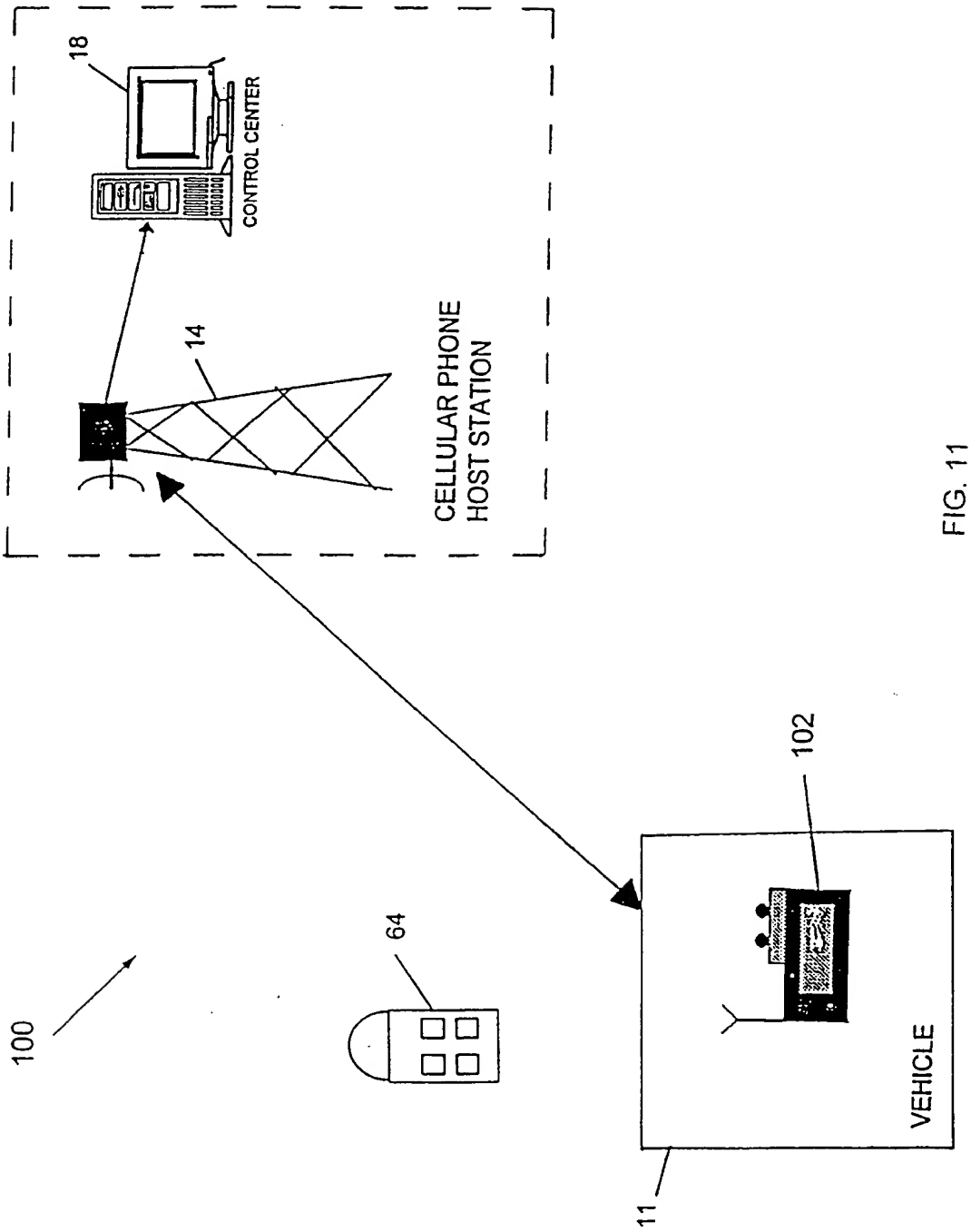

FIG. 11

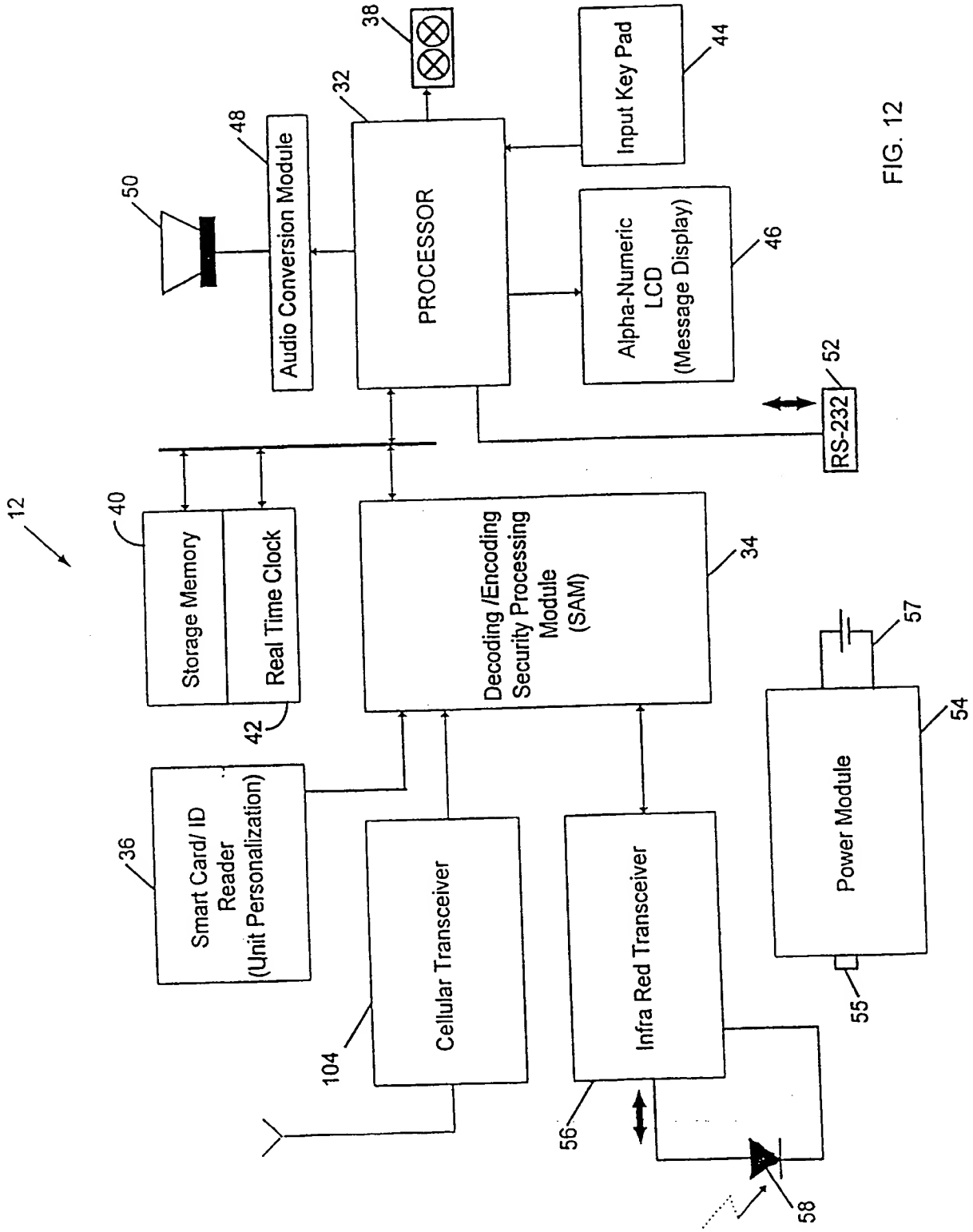

FIG. 12

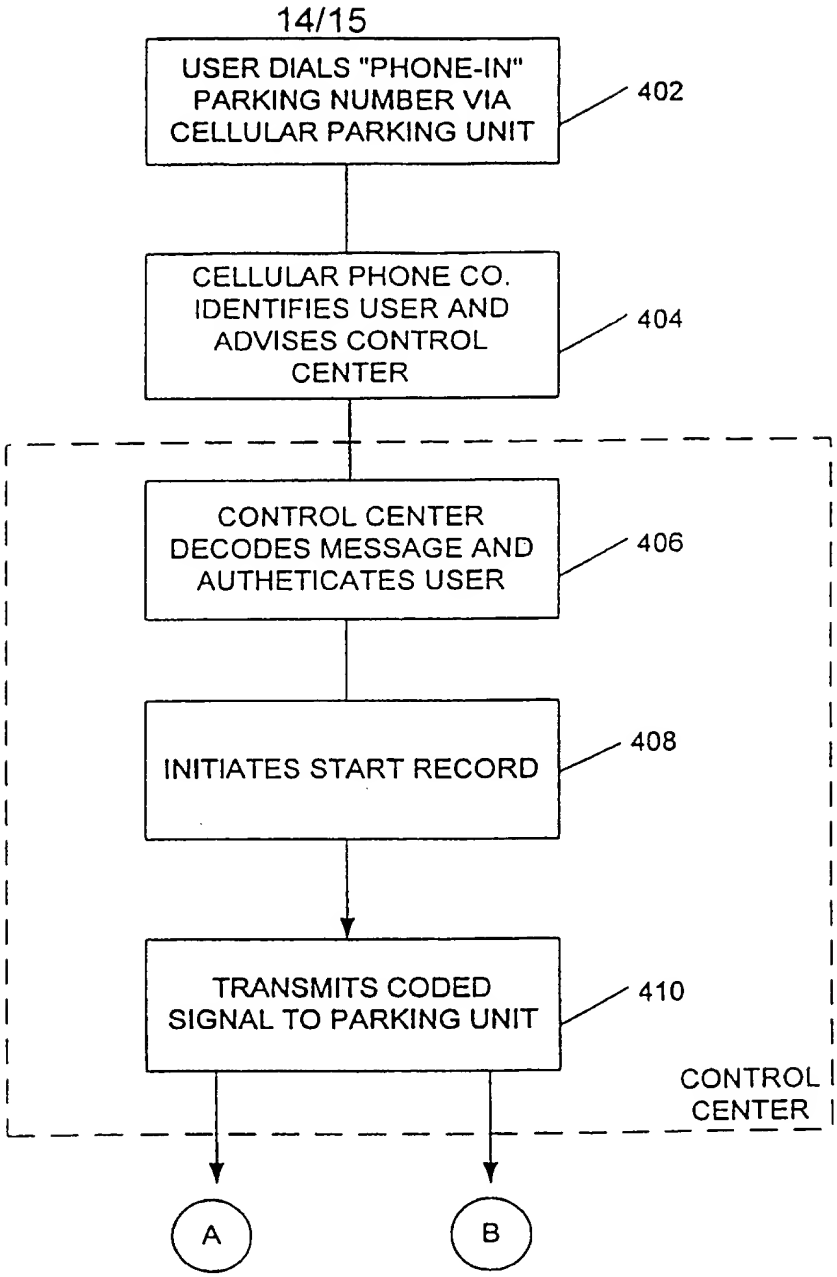

FIG. 13/1

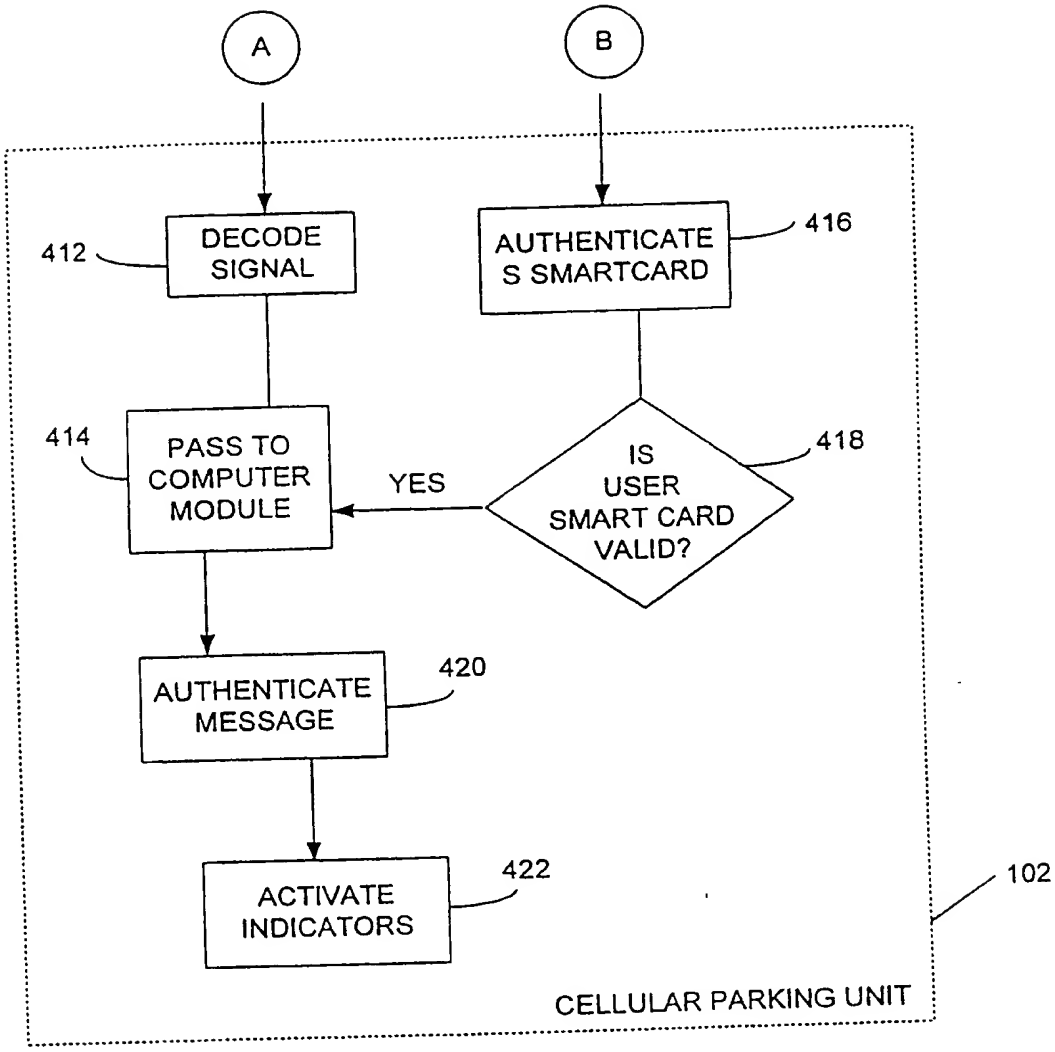

FIG. 13/2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL99/00172

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G07B 15/00; G08G 1/14
US CL :340/825.34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 340/825.34, 928, 932.2, 309.15, 539, 825.31, 825.33, 825.44; 705/13, 42, 418; 235/384, 377, 378, 380; 368/7, 90, 4

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

None

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS MESSENGER
Search Terms: parking, management, managing

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,351,187 A (HASSETT) 27 September 1994, See entire document.	1-35
Y	US 5,339,000 A (BASHAN et al) 16 August 1994, See entire document.	1-35
Y	US 5,266,947 A (FUJIWARA et al) 30 November 1993, See entire document.	1-35
Y	US 5,166,680 A (GANOT) 24 November 1992, See entire document.	1-35

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document published on or after the international filing date

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search
16 JUNE 1999

Date of mailing of the international search report
01 JUL 1999

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